

Methods and Themes in Child Psychology

Daniel C. Hyde
Psychology 216

Developmental Psychology Methods: Lecture Objectives

- Scientific inquiry and knowledge
 - What is the scientific method?
 - What values and assumptions come with it?
- Research Methods
 - What research methods are used?
 - What are the strengths and weaknesses of these methods?
- Overarching Themes
 - What enduring questions does the field address?
 - Why are these questions important?

THE SCIENTIFIC METHOD AND EMPIRICAL KNOWLEDGE

Knowledge

"The question how knowledge should be defined is perhaps the most important and difficult ... with which we shall deal. This may seem surprising: at first sight it might be thought that knowledge might be defined as belief which is in agreement with the facts. The trouble is that no one knows what a belief is, no one knows what a fact is, and no one knows what sort of agreement between them would make a belief true..."

Bertrand Russell, *Theory of Knowledge* (1926)

The Scientific Method

- An approach to testing beliefs (**the approach we will value in this class**)
 - 1. Choosing a question to be answered
 - 2. Formulating a hypothesis regarding the question
 - 3. Developing a **empirical** method for testing the hypothesis
 - 4. Using **empirical** data yielded by the method to inform the hypothesis

The Scientific Method

- Assumptions
 - All beliefs can be wrong
 - Until tested, should be considered hypotheses
 - If tested and not supported by evidence, belief should be abandoned no matter how reasonable
- Values (worth determined by..)
 - Testable hypotheses
 - Relevant measures
 - Measurable evidence (empirical data)
 - E.g. not personal intuition/emotion/authority

Ethics

- Human subjects issues
 - Responsibility to make sure that the potential benefits outweigh the potential harm
 - Responsibility to have studies reviewed by institutional review board (IRB) before initiating.
 - Beginning in 1974
- Vulnerable populations
 - (children, clinical populations, etc.)
- Unethical examples:
 - Little Albert/White Bunny-Watson (1920)

Questions on Scientific Method?

RESEARCH METHODS AND MEASURES

Research Types: Correlational

- Correlation: an association between 2 or more variables (attributes)
- Logic of correlation
 - Range from -1 to +1
 - The closer to 0 the weaker the association
- Allows for prediction
 - Higher correlation = better prediction
- Major limitation: can NOT establish causation

Limitation 1: Establishing direction of causation

Number of firefighters is positively correlated with the size of the fire

- Alternative 1: More firefighters cause the fire to grow
- Alternative 2: Bigger fires cause more firefighters to be called to a scene.

Limitation 2: Real but spurious correlations

Number of storks is positively correlated with the birth rate in European countries

Number of pirates negatively correlated with global warming (rise in temperature)

Limitation 3: Third/mediating factor in correlations

- The amount of fun a college student has on Friday night is positively correlated with the likelihood of vomiting on Saturday morning
 - Fun causes throwing up?
 - More likely, a mediating factor: drinking

Research Types: Experimental

- Logic of experimentation
 - Manipulate experience received (between groups)
 - independent variable(s)
 - Measure response to experience
 - dependent variable(s)
 - If all other differences between groups are equal, differences in outcome measures can be causally linked to the differences in experience
- Allows for causal inferences to be made
- Limitations to experimental control
 - resources/ethical considerations/etc.

Research Designs in Child Psychology

1. Longitudinal

- Same children are examined repeatedly over a prolonged time period

Research Designs in Child Psychology

2. Cross-sectional

- Children of different ages or at one age are studied at a single time point

Research Designs in Child Psychology

3. Microgenetic

- Children are observed intensively when a developmental change is occurring (usually relatively short time period).

Test Case

- A group of friends claims that Baby Einstein Videos make your baby smarter.
- How could this be tested using each of these designs?
 - Longitudinal Design
 - Cross-sectional Design
 - Micro-genetic Design

Methods: Difficulties in studying children (compared to typical adult studies)

- No language/less developed language
- Limited time constraints
 - Less patient participants/less focus
- Less competent at following instructions
- Rapid change (especially in the first year)
 - Need for precise monitoring of age
- Sensitive population
 - Safety
 - Recruitment

Research measures

- Behavioral
 - Verbal/self-report
 - Yes/no
 - Qualitative
 - Interview
 - Decision/choice
 - Speed/reaction time
 - Accuracy
 - Observation
 - Unstructured Observation
 - Structured Observation



Structured Observation Example: Helping Behavior

(Warneken & Tomasello, 2006)

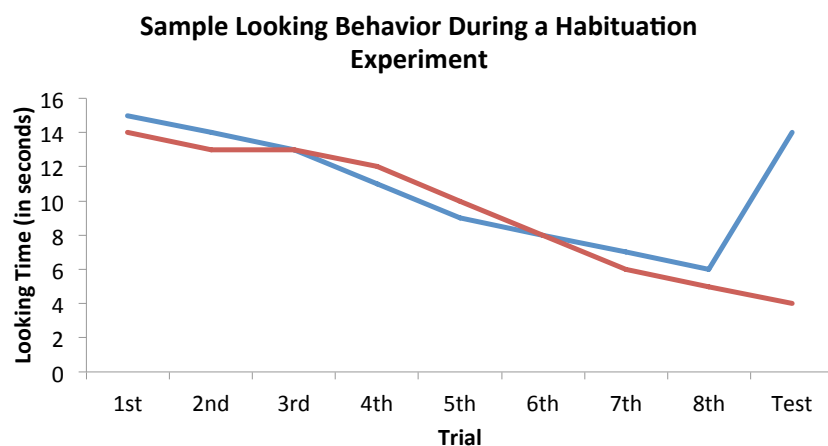


How about infants?

- Limited movement, decision making, and no/little verbal abilities?
- What can they do?
 - Look, hear, suck, turn head/orient

Infant Methods: Habituation

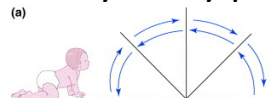
- Repeated presentation of same stimulus until boredom
 - Change property of interest and measure looking response
 - Increase in attention = noticed the change
 - Continued boredom = didn't notice the change
 - EX: color change, orientation change, shape change
 - Variation on visual habituation: non-nutritive sucking



Infant Methods: Violation of Expectation (VOE)

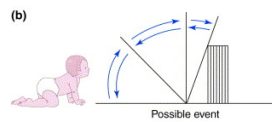
Spelke/Baillargeon

Physically possible vs. physically impossible

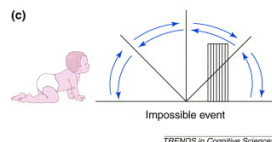


Logic:

Infants are interested in events that violate their expectations



Look longer at those events compared to events that seem normal



EX:

Infants have the expectation that solid objects can not pass through one another.

Look at the impossible event longer

Preferential Looking

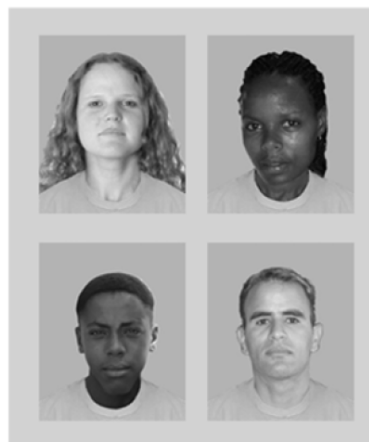


Infant Preferential Looking

- Logic: differential looking at the paired pictures indicates that infants notice a difference between them
- Why?
 - Will look at one item/event over another for a variety of reasons
 - Familiarity, personal preference, novelty, more interesting, etc.
 - Studies must be carefully designed and paired with control studies to rule out alternative explanations

Preferential looking example

- EX: Bar-Haim, Ziv et al, 2006
- Preferential looking study of race with 3 month olds
 - African infants raised in Africa prefer to look at African faces
 - African infants raised in Israel show no difference in looking



Physiological

- Heart rate
- Cortisol (indicator of stress)
- Respiration rate
- Brain response

Neural

- Neuropsychological (brain damage)
- Electroencephalography (EEG)
- Magnetic Resonance Imaging (MRI/fMRI)
- Near-infrared Spectroscopy (NIRS/fNIRS)

Nature's Experiments: Brain Damage

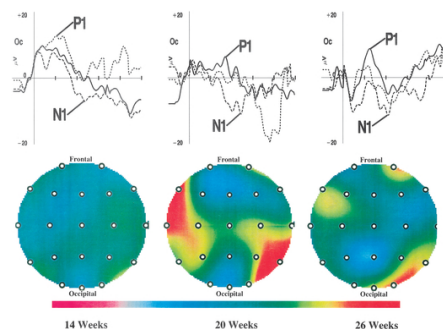
How does it happen?

- Birth defect
- Illness
- Stroke
- Accident/Injury
- Lack of oxygen

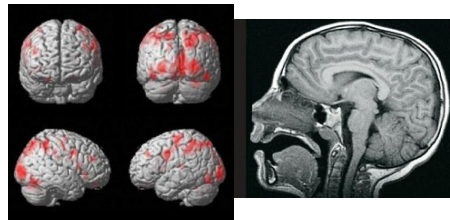
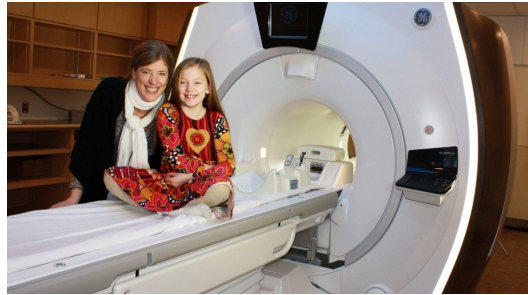
What can brain damage tell us?

- Tell us about the function of particular brain areas and role in development
- Tell us about mental organization
- EX: Apraxia, Agnosia (Prosopagnosia), Spatial Neglect, Aphasia, Acquired Psychopathy

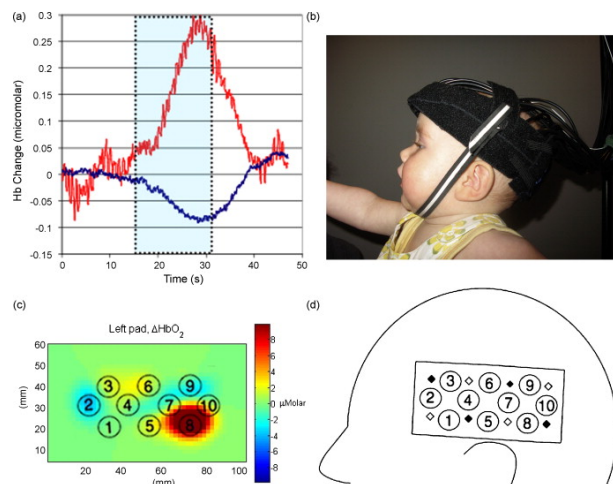
Electroencephalogram (EEG)/ Event-related potentials (ERPs)



Functional Magnetic Resonance Imaging (MRI/fMRI)



Near-infrared Spectroscopy (NIRS)

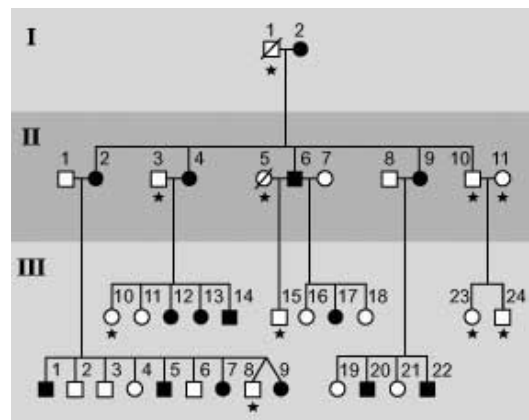


Other Measures: Genetics

- Study of DNA, genes, chromosomes, etc. to understand biological basis of development and disease.
- Behavioral genetics
 - Family studies
 - Twin studies
 - Adoption studies

EX: Family Studies of Specific Language Impairment

- KE Family tree
 - (4 generations)
 - 15 out of 37 suffered from SLI (black nodes)
 - ~41%
 - Prevalence in the general population is ~7%



Twin & Adoption Studies

TWIN TYPES

- Monozygotic/Identical
 - share 100% of their genes
- Dizygotic/Fraternal
 - share 50% of their genes

QUESTIONS

- Are identical twins more likely to demonstrate X than fraternal twins?
- Are identical twins raised in the same home more likely to show X than identical twins raised apart (adopted)?
- EX: IQ, sexual orientation, disease

Questions on Methods?

OVERARCHING THEMES

Nature vs. nurture?

- What are some traits you think are completely determined by your genes?
 - Does anyone disagree?
- What are some traits you think are completely determined by your environment?
 - Does anyone disagree?

Nature vs. Nurture: Language

- A vast majority of typically developing humans learn language
- Basic ability to acquire a language depends on genetic makeup (nature)
- Native language (which language you learn to speak) is dependent on the environment (nurture)
- What about language proficiency?
 - Vocabulary?

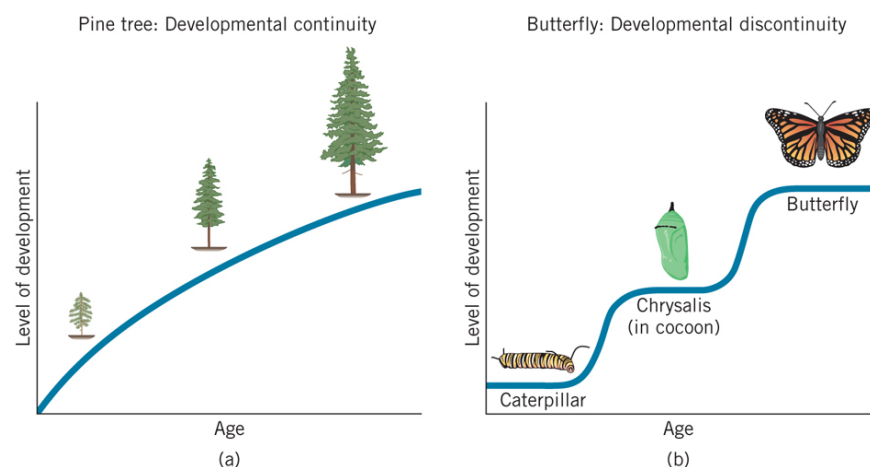
Overarching Question: Nature vs. Nurture

- Nature: our biological endowment/genetic inheritance
- Nurture: our environment(s)
 - What is our environment?
- Debate is...
 - Not either/or
 - Siegler et al. frames in context of how nature/nurture interact
 - What are the relative contributions of each to development
 - What abilities did evolution and/or genetics give us?
 - What experience(s) are responsible for development?

Nature and Nurture: Far reaching implications

- Understanding/knowledge of development
- Mechanisms of change
- Implications for individual differences
 - Cognitive abilities, IQ, behavior
- Role of environmental and educational conditions
 - Does one teaching style vs. another influence learning of math?
 - Does it matter what parenting style you use?
- Responsibility/Law
 - Should children be charged as adults?
 - Should mentally ill be held responsible?

Continuity/discontinuity over development



Continuity/discontinuity over development

- Ex: Piaget's conservation of liquid task



Theme: Multiple levels of analysis

- David Marr (1982)-3 levels
- Vision like an information processing system
- EX: How a child learns the alphabet
 - Computational
 - What does the system do/why?
 - Explanation of the behavioral development of gradually learning to identify letters with labels/stages/order etc.
 - Algorithmic/representational
 - How does the system do it?
 - Explanation of how the system calls on ability to represent shapes, visually and distinguish between those shapes, and form associations between shapes and language
 - Physical/Mechanistic
 - How is the system physically realized?
 - Explanation of how single cells, groups of cells, and brain networks send signals to accomplish letter recognize and remember letters.

Scales of study in developmental research

- **Ontogeny**: human lifespan
 - Most well known scale
- Tells us...
 - When developments happen (in lifespan)
 - How developments happen
 - Role of maturation vs. experience in development
 - What changes, what stays the same
 - When practices or policies (experiences) are most beneficial or harmful

Scales in Developmental Research

- **Cross-cultural**: study of different groups
 - Also well known
- Can tell us...
 - What is universal to humans/what varies between humans
 - Role of experience (ex: geography, economy, technology)
 - What practices/policies are most beneficial/harmful

Scales in Developmental Research

- **Phylogeny:** evolutionary development of species
 - Less well known
- Tells us...
 - When (evolutionarily speaking) abilities appear
 - Human nature- what abilities we share, what abilities are unique
 - Allow for more invasive paradigms
 - Ex: controlled rearing
 - (in some cases) establish stronger evidence for causal relationships than studies of humans

Review

- Scientific inquiry tests beliefs with empirical data
- A variety of measures, including many non-verbal measures, are used to overcome the difficulties in investigating developmental populations
- The nature/nurture debate now focuses on identifying the contributions of genes and experience to development (rather than which one underlies development)

Next 4 Lectures

- Biology, Behavior, and Brain Development I
 - Prenatal and newborn
- Biology, Behavior, and Brain Development II
 - infant, child, and adolescent
- Numerical Development
- Spatial Development